The Distinction Between Rate and Ratio Is Important

I recently read the article in the September-October 1988 issue of *Public Health Reports* on "Standard Terminology for Reporting of Reproductive Health Statistics in the United States."

I would like to take issue with one small point in an otherwise excellent article. This point has to do with the statistics used to measure maternal mortality.

It has been conventional to report a maternal mortality "rate" that is the number of maternal deaths divided by the number of live births (or, occasionally, pregnancies) in the same year multiplied by 1,000, 10,000, or 100,000.

Technically, of course, this is a ratio not a rate. This comment is more than simply pedantic. This confusion has retarded research in maternal mortality. What I would recommend, and what is, in fact, becoming the convention among researchers in the field, is to define the ratio as maternal deaths/live births and the rate as maternal deaths/number of women of reproductive age. The former measures primarily the obstetric risk, the latter measures the combination of obstetric risk and the frequency of exposure to that risk. In some circumstances the ratio is the better measure to use, in others the rate is more useful. But the distinction is extremely important to make, especially to those of us who work in public health. An earlier article (*1*) illustrates how one can reach the wrong conclusion by using the wrong measure.

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Reference.................................

1. Fortney, J. A.: The importance of family planning in reducing maternal mortality. Studies in Family Planning 18:109–114, March-April 1987.

The Internal Inconsistency Was a Conscious Choice: Dr. Cefalo and Mr. Gay Reply

Dr. Fortney and Dr. Ahmed correctly note that the interorganizational report "Standard Terminology for Reporting of Reproductive Health Statistics in the United States" follows tradition in setting forth as "Maternal Mortality Rate" what should more accurately be described as a ratio. The representatives consciously elected this internal inconsistency (the difference between a rate and ratio is defined earlier in the paper for readers) to avoid what they judged would result in greater confusion by making an abrupt change in the designation of a well-known measure.

Note that the paragraph introducing the formula (p. 469) says,

" . . . the population at risk should theoretically include all fetal deaths (reported and unreported), all induced terminations of pregnancy, and all live births. Because . . . [the information is not all required to be collected currently], the entire population at risk can not be included in the denominator. Therefore, the total number of live births has become the generally accepted denominator. It is recommended that when complete ascertainment of the denominator (that is, the number of pregnant women) is achieved, that a modified maternal mortality rate be defined, in addition to the traditional rate."

Likewise, in response to Dr. Ahmed's objection to the use of "Induced Termination of Pregnancy Ratio II" to describe what he asserts is a rate, you will note that the preceding paragraphs (p. 469) allude to live births as a "surrogate measure of pregnancy." Even with the addition of "reported fetal deaths" and "number of induced terminations of pregnancies" to the denominator, the text explains the sum is an "estimate" of pregnancies that "more closely approximates [but does not equal because of unreported, largely very early pregnancy loss] in the population at risk."

The representatives struggled with what degree of change would clarify, and what would confuse. Their judgment—for example, that the term "maternal mortality rate" was familiar and widely understood by physicians and, even though technically inaccurate, was not presently causing confusion—is open to criticism, as the writers contend. It is their hope that this report will make a bridge toward a still more consistent approach in the future, as data collection and analysis catch up with statistical theory and logic.

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C Section Rates and Increased Malpractice Premiums—An Alternate Explanation

I am writing to you regarding the paper entitled "Malpractice Premiums and Primary Cesarean Section Rates in New York and Illinois," by Steven M. Rock, which appeared in the September-October issue (Vol. 103, No. 5, p 459) of *Public Health Reports*. Dr. Rock found a correlation between increased malpractice insurance rates and increased cesarean section rates and concluded in his summary that "a substantial impact was found on delivery decisions resulting from the fear of malpractice suits."

I would like to suggest an equally plausible alternative to fear of malpractice suits as the agency for the

correlation found: the physician reward system. A simple C-section requires about an hour of OB-Gyn time, whereas vaginal delivery may require many times that— yet the financial reward for the surgical procedure is much greater. I submit, therefore, that Dr. Rock should include the procedure-oriented reward system as having an at least equal "impact" on delivery decisions as fear of malpractice suits. The question that needs to be asked is: what would be the impact if vaginal delivery was rewarded at double or triple the fee for cesarean section?

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Reply to Dr. Johnson: Other Control Variables Need to be Explored

Dr. Johnson has suggested that my finding that higher rates of primary cesarean section were associated with territories where malpractice premiums were higher could be due to "the physician reward system" instead (1). While the differential cost and time between a cesarean and a vaginal delivery could be an influence in the overall use of cesarean section, it would not explain intrastate cesarean differences. That is, this differential is likely similar in all the insurance rate territories. Even if there were systematic geographic differences, it would be unlikely that data would be available to quantify this.

There are two aspects of Dr. Johnson's comment that should be amplified. First, since my analysis correlated cesarean section rates and malpractice insurance premiums by territory, other control variables that could intervene in this correlation need to be explored. While this was beyond the scope of the original paper, I am completing a study that simultaneously controls for patients' medical indications, hospital technological facilities and procedures (for example, monitors), and type of patient insurance, as well as malpractice premiums. For a sample of 140 New York hospitals, the positive and significant relationship between primary cesarean section and malpractice insurance premium remains after controlling for these other factors.

A second issue relates to the impact of differences in time and cost in the choice of delivery procedure. Two comprehensive studies have documented that physician fees, insurance reimbursement, and hospital charges (due to greater length of stay) are typically higher with cesarean section (2,3). In addition, the procedure involves a more predictable expenditure of time. However, greater physical and emotional effort, as well as the training necessary, may be involved with cesarean section. In 1986, according to the Metropolitan Life Insurance Company, the average cesarean delivery cost $5,270 compared with $2,900 for a vaginal birth (4).

Even with the financial incentive that may exist with a cesarean section, concerted efforts to reduce this procedure may be effective. In one hospital, a program begun in 1986 that includes a second opinion requirement, objective criteria for four common cesarean indicators, and review of all procedures and physician surgery rates succeeded in lowering the cesarean rate (5). A national sample of about 400 hospitals covering 1984 indicated a 4 percent lower cesarean section rate where there was mandatory consultation before primary cesarean delivery, but the same rate whether or not there was a committee audit of all cesarean births (6). Clearly, a multi-faceted approach to understanding and controlling cesarean section is required.

Steven Rock, Associate Professor, Northern Illinois University, DeKalb

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